

Exploring Information Ethics

A Metadata Analytics Approach

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Abstract

Information ethics is a multi-faceted and multilayered concept that covers such issues as social responsibility, citizenship, global information justice, freedom of speech, copyright, and privacy, to name a few. The *International Review of Information Ethics* lists the Internet, computer science and library and information science as areas that are concerned with research and development in the discipline of information ethics. It is evident that the discussion and discourse of information ethics cuts across various scholarly and disciplinary boundaries. To provide a coherent and integrated perspective of the scholarly activities in information ethics, a comprehensive analysis and presentation of publication trends will prove particularly useful. This kind of analysis will make a contribution to the development of a knowledge map of scholarly activities in information ethics and encourage collaborative research and scholarship.

Information ethics is a subject area that has recently attracted substantial attention from various domains and disciplines. Researchers and scholars from various disciplinary backgrounds have discussed this topic. The *International Review of Information Ethics* (2005) published by the International Center for Information Ethics (ICIE) lists the following areas that are concerned with information ethics:



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- Internet;
- computer science; and
- library and information science

Capurro (2005) believes that information ethics deals particularly with ethical questions in

- the Internet (cyberethics, information ethics in a narrower sense);
- computer science (computer ethics);
- the biological and medical sciences (bioinformation ethics);
- the mass media (media ethics);
- the library and information science field (library ethics); and
- the business field (business information ethics) [p. 7].

As noted by Froehlich (2004), information ethics has evolved over the years into a multi-threaded phenomenon, stimulated in part by the convergence of many disciplines on issues associated with the Internet. It can now be seen as a confluence of the ethical concerns of

- media;
- journalism;
- library and information science;
- computer ethics (including cyberethics);
- management information systems;
- business; and
- Internet.

The above descriptions of the scope of information ethics allude to the multi-faceted and multi-disciplinary nature of the topic and the ways in which it is viewed by researchers from different domains and disciplines. It appears that conducting a study to examine the scope and variety of topics related to information ethics is particularly timely. Floridi (2005) notes that the term information ethics has come to mean different things to scholars from various disciplines, including computer ethics, business ethics, medical ethics, computer science, the philosophy of information, social epistemology and library and information science. This, he argues, has resulted in confusion about the nature and scope of information ethics. He further argues that a field-dependent, applied and professional ethics approach to information ethics is problematic and that a macro-ethical approach should be adopted.

Ocholla, Onyancha, and Britz (2010) explored the concept *information ethics* using the most common co-occurring terms in the information ethics literature as indexed in nine databases. They analyzed the subject terms in more than 1,000 bibliographic records. They found that the most common term was

ethics with 613 hits in the compound subject terms, followed by information, legislation, jurisprudence, research, access, technology, standards, health, computer, education, and library. Others that produced a high number of hits included Internet, economics, libraries, and privacy. While this study provides insight into the subject terms in the bibliographic records on information ethics, its aim was not to identify disciplines and domains that are concerned with information ethics.

The purpose of this paper is to shed light on the history, volume, variety, and topics of publications on information ethics as reflected in the Scopus multi-disciplinary database of article publications. To achieve this, metadata records for the article publications on information ethics will provide a representative source of information. Metadata records consist of titles, authors, publication dates, abstracts, author-provided keywords, index terms, authors' affiliations, and countries. These metadata elements are particularly useful for trend and topic analysis. The study also aims to visually demonstrate the key information ethics themes, topics, as well as the authors and organizations that have contributed to the research and developments in this area. The key questions that this study addresses are:

- what are the *publication trends* for articles on information ethics?;
- who are the *top authors* of information ethics articles?;
- what *countries* and institutions are active in research in information ethics?;
- what *disciplines and domains* are concerned with research on information ethics?; and
- what are the *most frequently used terms* and topics in the titles, abstracts, and author keywords of article publications?

Addressing the above questions requires various analytical approaches, including textual, authorship, and trend analysis. The next section will provide a description of the methods and tools used to conduct these analyses.

Methodology

The methodological framework for conducting this study consists of a description of the nature and type of data; search and retrieval experiments conducted; data analysis methods used; and the information visualization tools employed.

Database

For this study, Scopus, a multi-disciplinary database of peer-reviewed article publications was used. It is owned by Elsevier and is only available online

A	B	C	D	E	F	G
Authors Title	Year	Source title	Abstract	Author Keywords	Index Keywords	
1 Bendi O. Considerations about the r	2013	AI and Society	Ethics researches morality in respect to humans and animals. Animal ethics; Animal-machine interaction; Information ethics;			
2 Ephraim P.E. African youths and the dar	2013	Ethics and Information Ti with listing number of facebook, Twitter and MXit users; An Culture-centered approach; Cyber violence; Cyberbullying; Soc				
3 Kim H.S. Nat Effects of moral judgement	2013	Proceedings - International The importance of information ethics has emerged with the emotional control; Gifted student emotional control; Influential				
4 Gwak S., Kim Development and applicat	2013	Proceedings - International This study developed a tool to measure the level of informat Education; Information ethical se College students; Componen				
5 Roux B. Fair information ethics and information Fairness	2013	Ethics and information Fairness; Information ethics as a background Cognition; Law; Mind; Privacy; Cognitive activity				
6 Flordell L. Distributed Morality in an	2013	Science and Engineering The phenomenon of distributed knowledge is well-known in distributed morality; Information and communication technic				
7 LaMendola V. ETHIC AND VALUE CONSID	2013	Information Communica This paper continues the exploration of network society ethi ecological; ethics; interactional agency; relational				
8 Meng H.-J., Hsing cultural capital to an	2013	Global Journal of Enginee This study investigated the digital learning of children living Cultural capital of parents; Digital divide; Digital learning				
9 Hsieh P.-H., Does age matter? Student	2013	Nuclear medicine physicians are very involved in French on Cancer diagnosis; Information et anxiety; Cancer diagnosis; dox				
10 Dutler A. Thought on nuclear physi	2013	Nuclear medicine; Nuclear medicine				
11 Wong P.-H. From culture 2.0 to a neww	2013	There is never a shortage of celebrities and condemnable p Andrew keen; Autology; Clay Shirky; Digital media;				
12 Zimmer M. Patron privacy in the 2.0 er	2013	2013 Journal of Information EAs libraries begin to embrace Web 2.0 technologies to serve patrons;ushering in the era of Library 2.0;unique dilemma; artist				
13 Kaebernick G. Information ethics.	2013	access to information; editori				
14 Ragains P. The necessity and challeng	2012	2012 Hastings' Center rep; [No abstract available]				
15 Ozar D.T. Professionalism: Challeng	2012	2012 Communications in Info; [No abstract available]				
16 Morton A. S. Privacy is a process, not a p	2012	2012 Proceedings New Security Privacy research has not helped practitioners - who struggle Frameworks; Privacy; Trau data protection; Design Princ				
17 Hsieh P.-H., Asia Pacific Management As	2012	2012 Asia Pacific Management As pervasive computing applications advance, issues of Infor Information ethics; Intellectual property; Unauthorized software				
18 Killoran J.B. Is it "about us?" self-replic	2012	2012 Technical Communicatio Purpose; This article explores the purposes, character, and et About us" information; Ethics; Independent contractors and co				
19 McCann A.D. Establishing an online and	2012	2012 Journal of Human Lactat; Women of childbearing age, especially in industrialized naic blog; breastfeeding; enagagement article; breast feeding; consu				
20 Taddeo M. An analysis for a just Ober	2012	2012 Cancer BACKGROUND: The rapid pace of genetics research, coupled Database of Genotypes and Phenotype article; bioethics; female; ger				
21 Koskinen J.S. A viewpoint for more ethic	2012	2012 2012 Internationa This article focuses on the ethical analysis of cyber warfare; t Cyber warfare; information ethics; Conceptual analysis; Cyber w				
22 Koulouriou A., Policy route map for atode	2012	2012 Communications in ComHealthcare is a field where the influence of ethics needs to be-Government; e-Health; health-e-Government; Health; Heal				
23 Alfino M. Twenty years of informati	2012	2012 Journal of Librarianship & Information Research This paper presents a policy decision tree for digital informa Academic libraries; access; copyright; digital content; digital in!				
24 Liu C.-J., Yan Applying the practical inq	2012	2012 Journal of Information Et this paper presents a historical overview of IL and the Journal of Information Ethics.				
25 Spelloio R. Information and computer	2012	2012 Computers and Education The goal of this study is to better understand how the study's Distance education and telelearn Bloom's taxonomy; Distance +				
26 Samek T. I guess we'll just have to w	2012	2012 Journal of Information Et this paper reviews the intriguing history of information and computer ethics. Information ethics began as a branch of applie				
27 Hsieh P.-H., Cultural effects on percept	2012	2012 Journal of Computer Inf in most prior cross-cultural studies, which explored the inter Information ethics; Intellectual p cross-cultural studies; Cultural				
28 Davy Z., Schi Psychonauts: Conducting	2012	2012 Journal of Information Et this article provides a condensed chronological record of the formation of the Information Ethics IE Special interest Group I				
29 Samp J.C., Sc Retracted publications in t	2012	2012 Journal of Mental Health Background "Legal highs" are becoming increasingly common Drug forums; Novel Psychoactive recreational drug; articl; con				
30 Shahseen M. Information ethics in Pakis	2012	2012 Pharmacotherapy Recent studies have suggested an increase in the number of Drug information; Ethics; Evidence article; controlled study; drug				
31 Tulli M., Va Internet neutrality: Ethical	2012	2012 International Information This study examines the practice of information ethics of the Email discussion groups; Information ethics; Impact factor; Information ethics; Journal self				
32 Kostmuksi M. The role of references in si	2012	2012 Research Evaluation Scientific papers are often cited because they were selected Citation analysis; Impact factor; Information ethics; Journal self				
33 Hawkes N. Faith, hope, and charity.	2012	2012 Philosophy and Technol; This paper investigates the ethical issues surrounding the con Computer ethics; Internet neutrality; Network neutrality				
34 Hsieh P.-H., The patient, the physician,	2012	article; consume health info				
35 Meier B.W. The virtual mentor ; VM; [No abstract available]	2012	article; consume health info				
36 Zimmer M. The ethical (re)design of th	2012	2012 ACM International Confe Today, the Google Books project is at a relative standstill - la access to information; ethical des access to information; Ethical				
37 Zimmer M., Assessing the treatment o	2012	2012 ACM International Confe to embrace Web 2.0 technologies to serve information ethics; intellectual property; Anecdotal evidences; Inform				
38 Chang C.L.-H. How to build an appropri	2012	2012 Computers in Human Behav Confucian Ethics; codes play a vital role in clarifying the res; Confucian Ethics; Chinese companies; Confucia				
39 Douglass K. A framework for understan	2012	2012 Libri Conf				
40 Caywell M. Using classification to cons	2012	2012 Journal of Documentatio purpose: The purpose of this paper is to explore the imprial Accountability; Archival description; Archives; Archives manag!				

Table 1: Raw data on a search for *information ethics* in the Scopus database.

by subscription. Scopus covers more than 21,000 publications of which around 20,000 are peer-reviewed journals in the, technical, medical, and social sciences, and arts and humanities. It currently has more than 53 million records, mainly from 1995 onward (Elsevier, 2014).

Searches Conducted

An exact phrase search was conducted on the term *information ethics* in the title, abstracts, author keywords, and indexed keywords of publications indexed in the Scopus database. There were 313 records retrieved on December 20, 2013. The metadata records for the 313 records were downloaded onto an Excel file for later analysis. The author is aware of the limitations of this kind of search. For instance, searches could have been conducted on such terms as *library ethics* or *social responsibility in librarianship* or *ethical librarianship*. However, as the aim of this paper was to specifically examine how the term *information ethics* has been treated and approached in the publications, the search was confined.

The metadata elements that were examined for analysis in this study are the following:

- author;
- title;
- author keywords;
- indexed keywords (MeSH, Emtree, Engineering controlled term);
- abstract;
- publication date;
- publication source; and
- author's country.

Table 1 shows a screenshot of raw data in an excel spreadsheet.

Data Analysis Methods

The following text analysis and visualization tools were utilized to analyze and create visual and graphical representations of the retrieved data:

- OpenRefine;
- TAPOR (Text Analysis Portal);
- AutoMap;
- Many Eyes (IBM); and
- Visual Understanding Environment (VUE).

The first step in the analysis of data was related to data cleaning and pre-processing. OpenRefine was used for this task. OpenRefine is a powerful open source tool that allows cleaning of messy data and its transformation from one format into another. The application provides sophisticated clustering features that are useful for detecting similar terms that are separated as a result of parts of speech, such as *information ethics* and *ethics of information*. These terms may be separated alphabetically, but OpenRefine detects similar patterns, clustering them accordingly. This is useful for large data sets.

All author keywords that contained semicolons were removed and stored in a text file. Text Analysis Portal (TAPOR) tools and Automap were used to analyze the text of titles, abstracts, author keywords, and indexed keywords. These two tools provide a wide range of text analysis functionalities, such as term extraction, term frequency, analysis of parts of speech, keyword-in-context analysis, and stop word lists. TAPOR and Automap were used to identify authors' most frequently used terms.

Data Visualization

In order to provide various visual representations of the analyzed metadata records, a number of visual tools were used. IBM Many Eyes was used to create bubble charts, geographic representations of countries, and high frequency term representations. The Scopus database also provides visualization of search results known as *Analyze search results*. The visualization of source counties for the publications on information ethics as well as document type distribution were obtained from the Scopus database. The Visual Understanding Environment (VUE) was used in this paper to visualize the broad thematic categories for information ethics as reflected in the analyzed metadata records. It is an open source tool project based at Tufts University. It creates flexible tools for managing and integrating digital resources in support of teaching, learning, and research. This methodological framework provides a generalizable approach for conducting topic and trend analysis for many different subject areas and domains.

Findings

In the following, findings are arranged in the order of the study research questions presented above: publication trends, top authors, source countries for publications on information ethics, disciplines and domains concerned with information ethics, most frequently used terms and topics, and the thematic categorization of information ethics.

Publication Trends

The first question of this study was *what are the publication trends for articles on information ethics?* This broad question aimed at providing an overarching picture of the publications on information ethics. To this end, two specific sources were consulted to identify the pattern of publications. The first source was the Google Books Ngram Viewer, which is a freely available web-based application that makes use of more than 5 million books to show book publication trends for various topics. For this study four search terms were entered *information ethics*, *Information Ethics*, *Information ethics* and *INFORMATION ETHICS*. *Figure 1* shows the Google Ngram viewer for these terms.

As can be seen from this graph, the publication of books on information ethics dates back to the early 1980s. Another observation is that the highest frequency of occurrence of the term is associated with the lower case, i.e., *information ethics* as shown by the line. It should be noted that the Google Books Ngram Viewer only shows book publications until 2012.

To gain a comparative perspective of article publications for the term *information ethics*, the Scopus database was used to ascertain the longitudinal trend for non-book publications. *Figure 2* shows a graph from the Scopus database of the distribution of publications over the course of 37 years.

Figure 3 depicts how the publication of articles, reports, and conference papers on information ethics started in the 1980s, with an incremental growth in the 1990s, and then in the 2000s. The year 2011 has the highest number of publications on the topic. These two graphs indicate that the term *information ethics* started appearing in books, journal articles, and conference papers in the 1980s.

Top Authors

As part of the mapping of the literature on information ethics, the question *who are the top authors of information ethics publications?* was formulated. It should be noted that only the articles indexed in the Scopus database were used and that only first authors were considered for this analysis. The author acknowledges that this decision may be viewed as a limitation for this analysis. However, given the limited number of publications, it was important to identify the authors with higher number of publications. Based on this analysis there were 42 authors who had two or more publications. *Figure 3* shows a bubble chart of the top 42 authors. The top five authors in this list are Floridi, Capurro, Ess, Smith and Buchanan. A complete list of all the 42 authors is provided in the Appendix.

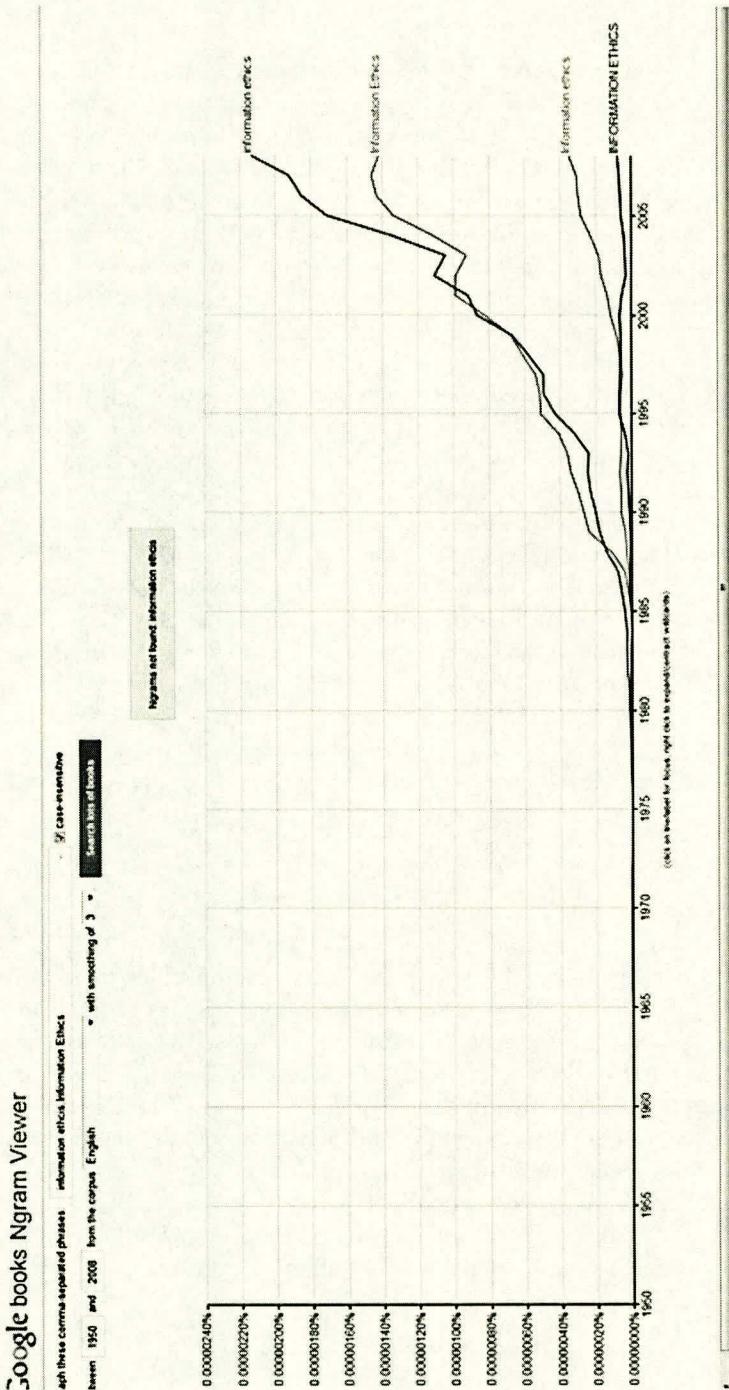


Figure 1. Google Books Ngram Viewer graph for *information ethics*

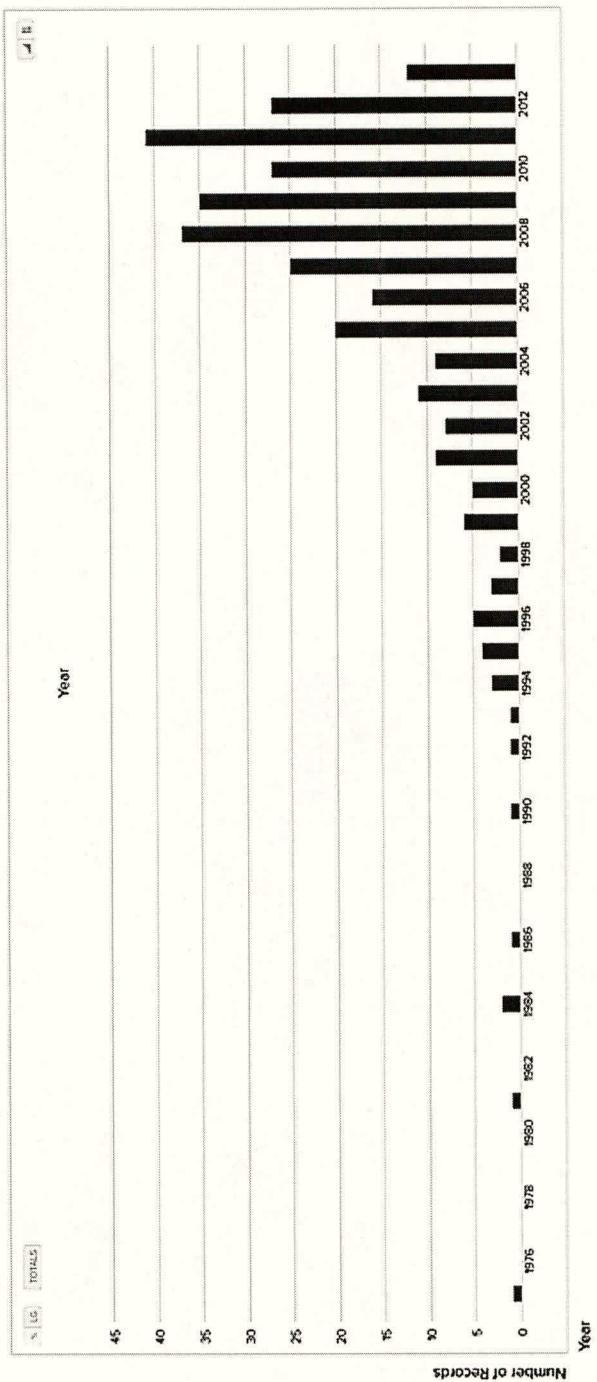


Figure 2: Scopus articles on *information ethics* distribution over 37 years (1976–2013)

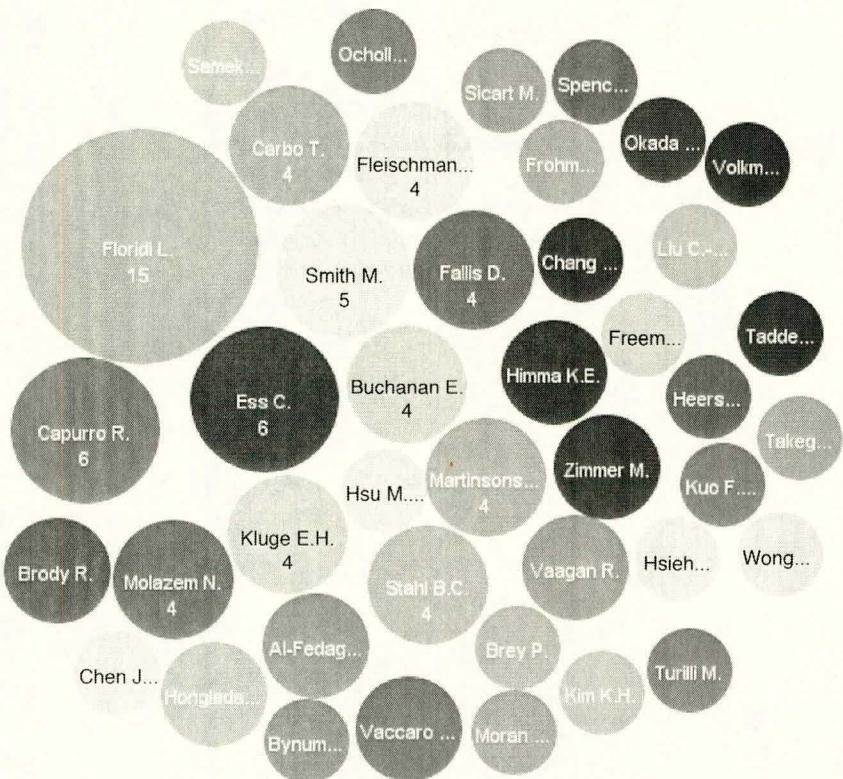


Figure 3. Top 42 authors of information ethics publications as reflected in the Scopus database

Source Countries for Publications on Information Ethics

One of the research questions in this study aimed at identifying the main source countries for publications on information ethics. *Figure 4* shows the top 15 countries that have contributed most of the publications in the area of information ethics.

In addition to source countries, it is useful to identify the top source publications in which information ethics papers have appeared. There are 37 publications that have published 2 or more papers on information ethics. *Figure 5* shows the top 11 publications. *Ethics and Information Technology* and the *Journal of Information Ethics* are the two journals with a particular focus on publishing information ethics papers.

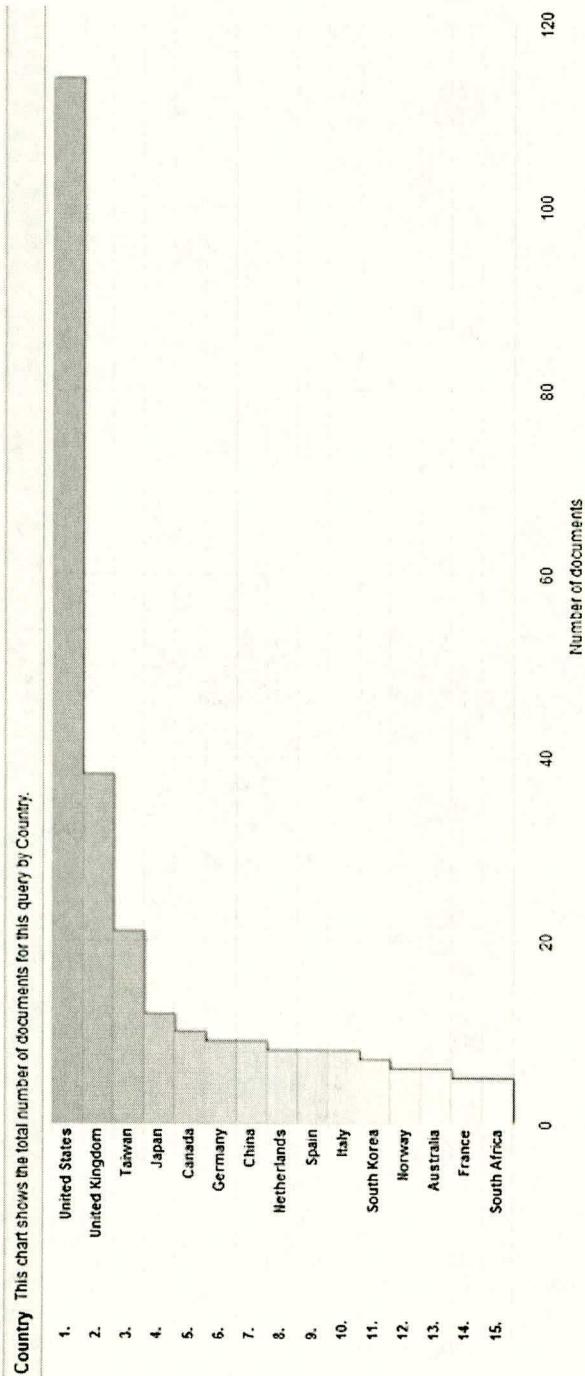


Figure 4. Top 15 source countries for information ethics publications

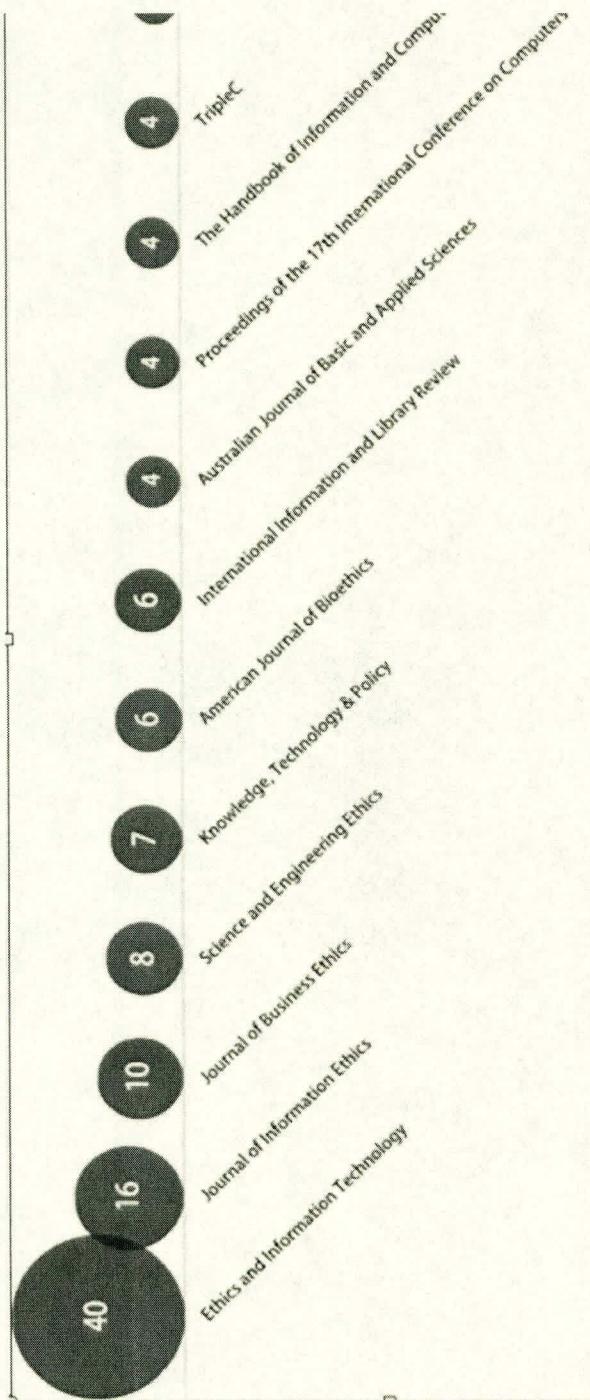


Figure 5. Publications with the highest number of information ethics papers

Disciplines and Domains Concerned with Information Ethics

As was stated earlier, information ethics is a multi-disciplinary domain that cuts across several subject areas. One of this study's key questions focused on the identification of domains and disciplines that contribute to information ethics. The *Analyze search results* feature in Scopus was used to identify the subject categories *information ethics* papers have been assigned.

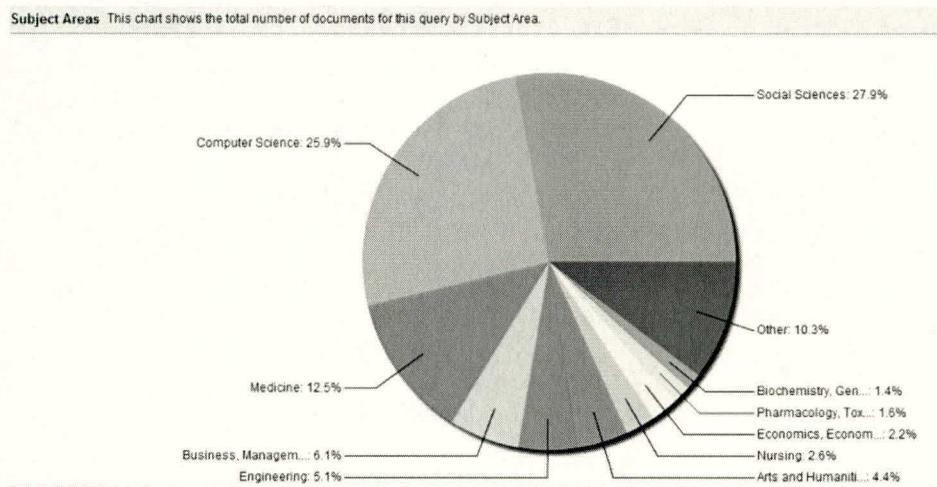


Figure 6. Scopus subject categories for publications on information ethics

Figure 6 shows a pie chart of the Scopus subject categories assigned to information ethics publications. As figure 6 shows, the main subject categories include social sciences, computer science, medicine, business and management, engineering, followed by arts and humanities. Although this categorization is broad in nature, it does provide an overview of the multi-disciplinary nature of information ethics publications.

Most Frequently Used Terms and Topics

One of the key research questions raised in this study was to examine the most frequently used terms in the publications on information ethics. A number of tools were used to textually analyze the titles, abstracts, author assigned keywords, and indexer assigned keywords to identify frequently used terms in the metadata records for information ethics papers. Figure 7 shows the most frequently used terms in the titles of publications on information ethics.

As can be seen in figure 7, terms such as *privacy*, *global issues*, *health*, *edu-*

Words	Distribution Counts
information	181
ethics	154
ethical	38
privacy	27
computer	21
research	13
study	13
social	12
issues	12
global	12
health	10
model	9
society	9
education	9
data	9
perspectives	9
internet	9
business	8
development	8
students	8
use	8
systems	8
teaching	8
la	8
web	7
digital	7
security	7
moral	7
rights	7
professionals	7
future	7
online	7

Figure 7. Most frequently used terms in the titles of publications on information ethics

access	5
online	7
library	7
theory	7
science	6
using	6
practice	6
value	6
design	6
technology	6
management	6
challenges	6
Students'	6
intellectual	6
property	6
decision	5
framework	5
values	5
drug	5
role	5
Introduction	5
challenge	5
medical	5
century	5
context	5
cultural	5
making	5
public	5
Florida's	5
patient	5
direct-to-consumer	5
reflections	5
objects	5
access	5
marketing	3
pluralism	4
foundation	4
lust	4
perspective	4
islamic	4
electronic	4
university	4
personal	4
africa	4
searching	4
applying	4
human	4
right	4
control	4
view	4
intercultural	4
based	4
en	4
software	4
confidentiality	4
clinical	4
considerations	4
report	4
life	4
problem	4
china	2

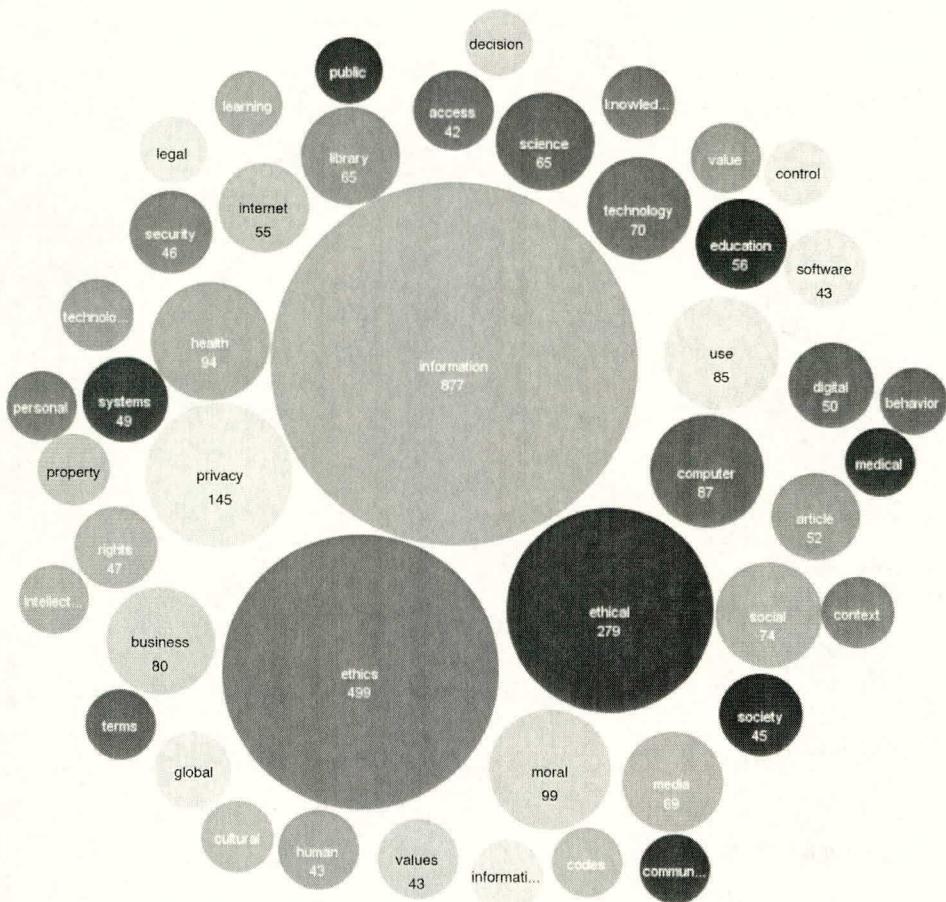


Figure 8. 46 Most frequently occurring terms in the abstracts of publications on information ethics

cation, teaching, and Internet are among the most frequently used terms in the titles by authors.

Figure 8 shows the 46 most frequently occurring terms in the abstracts of publications on information ethics. Evidently, the terms information, ethics, and ethical are among the most frequently occurring. What is also interesting is the occurrence of terms such as *privacy*, *health*, *moral*, *computer*, *digital*, *technology*, *business*, and *library*.

The keywords assigned by authors of the analyzed publications provide insight into some of the conceptual underpinnings of information ethics. *Figure 9* shows a list of the 50 most frequently assigned keywords to the publications by authors.

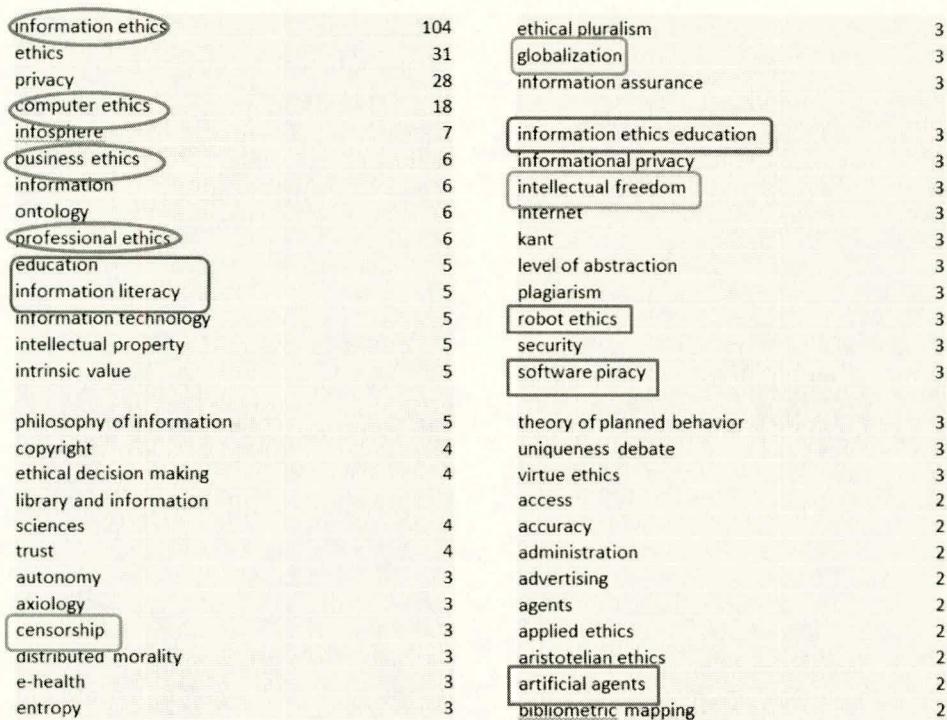


Figure 9. 50 most frequently assigned keywords by authors

It is useful to examine the indexer assigned terms from the perspective of frequency of their occurrence. *Figure 10* shows the top 40 indexer assigned terms.

As *figure 10* shows, we note that frequently occurring terms include those that have medical, informational, technological, educational, or business focus. These terms occur in the frequently occurring terms in titles, abstracts, and author assigned keywords.

Thematic Categorization of Information Ethics

Having analyzed and visualized the titles, abstracts, author assigned keywords, and indexer assigned terms, a question remains to be answered: What can we learn from these analyses? In other words, can we use the terms appearing in different metadata elements to infer broad categories that would characterize information ethics as a subject area? A close examination of the above analyses may provide a broad conceptualization of information ethics and its various aspects or dimensions. Using the Visual Understanding Envi-

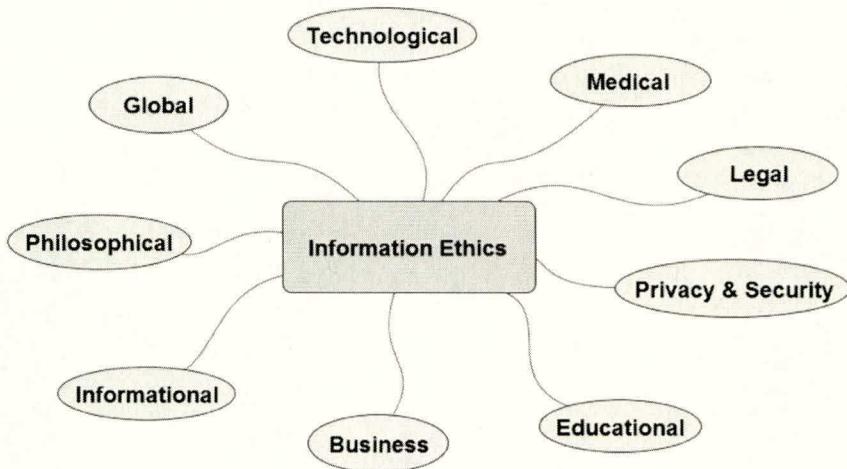


Figure 10. Top 40 indexer assigned terms to information ethics publications

ronment (VUE) tool, *figure 11* depicts the 9 aspects or dimensions of information ethics.

Figure 11 is the outcome of the analysis of term frequency using various metadata elements for information ethics publications. These aspects or dimensions may be viewed as different subject areas, domains, or disciplines. What is important in this figure is the multi-dimensionality and multi-faceted nature of information ethics as a subject area. In order to further contextualize these broad themes, a more detailed account of each theme is presented in *figure 12*. This type of conceptualization will assist in providing a more comprehensive view of the subject of information ethics.

In addition, the knowledge organization scheme depicted in *figure 12* provides a basis for a detailed analysis of the specific aspects of and topics related to information ethics as reflected in the analyzed metadata records.

The study reported here contributes to our understanding of the multi-faceted nature of the area of information ethics. Teaching of and conducting research into information ethics requires a comprehensive and inclusive coverage of the subject area. This study is a step towards mapping the publications and scholarly work on information ethics for research, teaching, and education purposes. The research questions addressed in this study are fundamental as they explore how information ethics is perceived, understood, and researched by scholars.

While the analytical framework presented in this study is useful and can be applied to other topic and trend analysis studies, it has its own limitations. One such limitation is that the Scopus database, used in this study, does not cover all the publications on information ethics. Another limitation lies in the restrictive use of the term *information ethics* for the searching and retrieval of

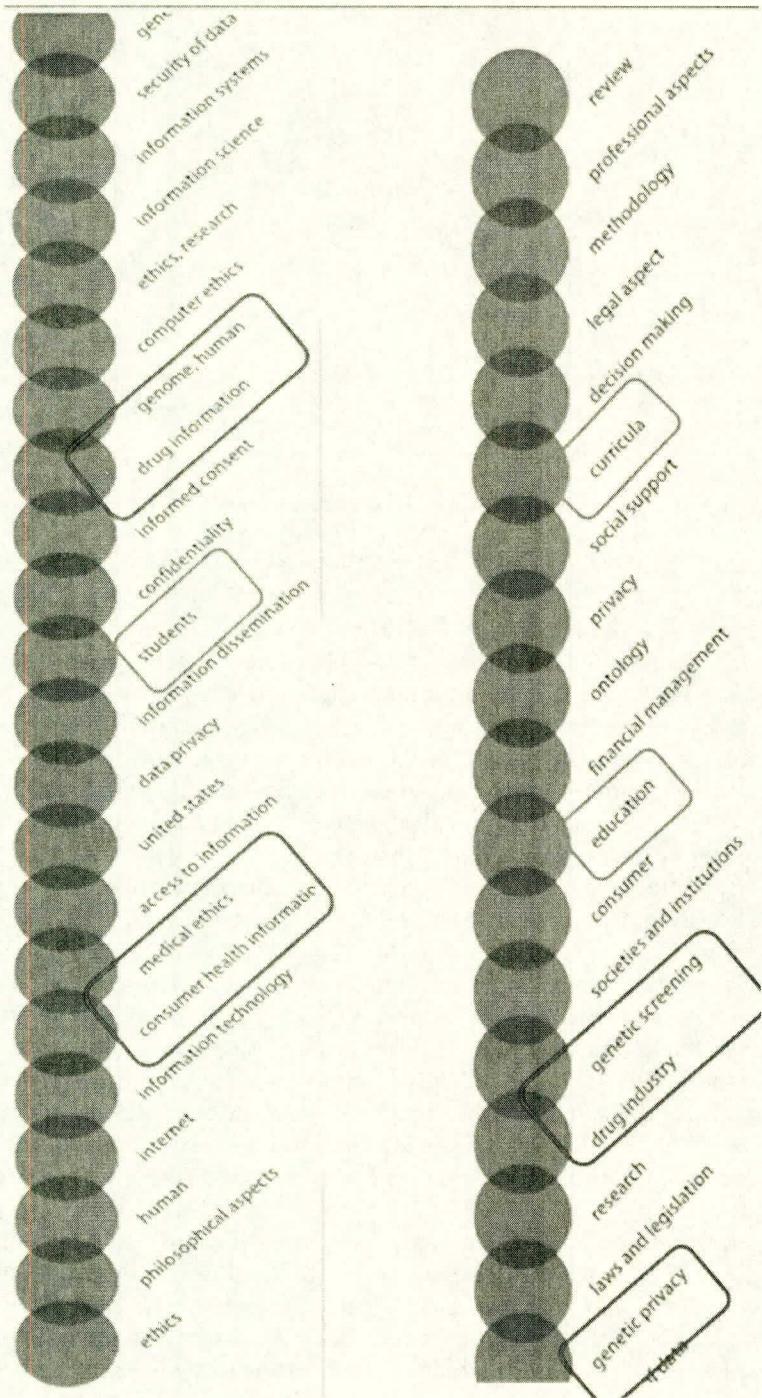


Figure 11. Broad thematic aspects and dimensions of information ethics

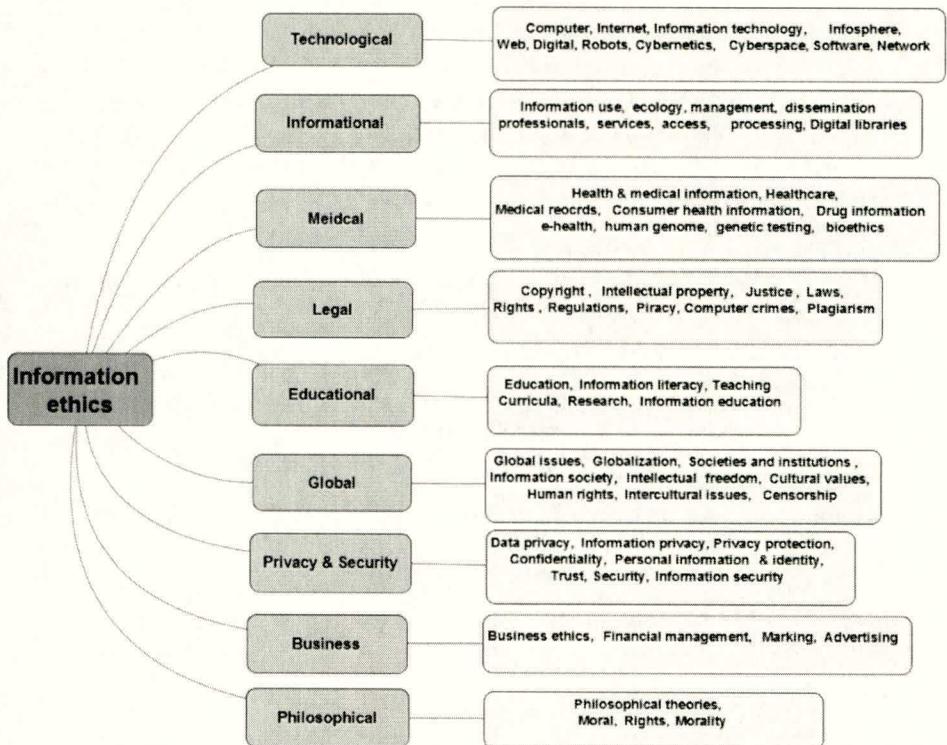


Figure 12. Information ethics thematic categories

publications on information ethics in this study. Some studies and projects may not necessarily use the term information ethics to refer to this multi-faceted and multi-disciplinary area.

Conclusion

In this paper, a metadata-based knowledge organization approach was adopted to examine the literature of information ethics as reflected in the Scopus multi-disciplinary database. A detailed textual analysis of metadata records for information ethics publications demonstrated that information ethics is a multi-disciplinary subject that has been approached from various perspectives. These perspectives include global, legal, medical, technological, informational, philosophical, educational, business, and privacy and security. Furthermore, frequency term analyses conducted in this study found that information ethics is finding its way into such areas as education, health, and business. As the critical importance of information ethics becomes increasingly evident, the the-

matic categorization presented in this study will be useful for education and research purposes. For instance, the thematic categorization could serve as a basis for developing courses and educational materials for various purposes. Furthermore, scholars and other researchers may find the knowledge organization approach presented in this paper useful for developing an inclusive and comprehensive perspective of different aspects and dimensions of information ethics both as a research and/or practice endeavor.

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- OpenRefine: <http://openrefine.org/>
- Visual Understanding Environment (VUE): <http://vue.tufts.edu/>

Appendix

Top 42 authors of information ethics papers as reflected in the Scopus database (based on the number of papers published)

Floridi L.	15	Stahl B.C.	4
Capurro R.	6	Al-Fedaghi S.	3
Ess C.	6	Brody R.	3
Smith M.	5	Himma K.E.	3
Buchanan E.	4	Hongladarom S.	3
Carbo T.	4	Vaagan R.	3
Fallis D.	4	Vaccaro A.	3
Fleischmann K.R., Koepfler J.A., Robbins R.W., Wallace W.A.	4	Zimmer M.	3
Kluge E.H.	4	Brey P.	2
Martinsons M.G., Ma D.	4	Bynum T.W.	2
Molazem N.	4	Chang C.L.-H.	2
		Chen J.V., Pfleuger, P., Jr.	2

Freeman L., Peace A.G.	2	Okada M., Yamamoto K.,	
Frohmann B.	2	Watanabe K.	2
Heersmink R., van den Hoven J., van Eck N.J., van Berg J.d.	2	Samek T.	2
Hsieh P.-H., Lee T.-K.	2	Sicart M.	2
Hsu M.-H., Kuo F.-Y.	2	Spence E.	2
Kim K.H.	2	Taddeo M.	2
Kuo F.-Y., Hsu M.-H.	2	Takeguchi K., Kikuchi A.	2
Liu C.-J., Chang S.-M.	2	Turilli M.	2
Moran G.	2	Volkman R.	2
Ocholla D.	2	Wong P.-H.	2

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